

L16 ANSWER 4 OF 48 WPIX (C) 2003 THOMSON DERWENT

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TI Production of foamed styrene resin bead by mixing and polymerizing styrene, crosslinking agent, chain transfer agent, initiator, surface active agent and dispersion master to a conversion rate.

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NOVELTY - A foamed styrene resin bead is produced by mixing and polymerizing a pre-mixture containing styrene monomer, crosslinking agent, chain transfer agent, initiator and surface active agent and a dispersion master to a conversion rate. This is followed by polymerization with additional styrene monomer and dispersion master.

DETAILED DESCRIPTION - A foamed styrene resin bead is produced by:

(a) a first polymerization step in which a pre-mixture (10 - 30 weight%) comprising styrene monomer, crosslinking agent, chain transfer agent, initiator and surface active agent, dispersion master (0.5 - 6 weight%) which comprises pure water and dispersing agent, hot pure water (50 - 55 weight%) and styrene monomer (1 - 15 weight%) are mixed at 50 - 70 deg. C. The reactor is then heated to 80 - 100 deg. C;

(b) a second polymerization step in which the pre-mixture (5 - 25 weight%), styrene monomer (1 - 15 weight%), cell controller (0.05 - 1 weight%) and the dispersion master are further added at a conversion rate of 5 - 15%;

(c) a third polymerization step in which the cell controller and the dispersion master are still further added at a conversion rate of 50 - 70%;

(d) a fourth polymerization step in which the dispersion master is further added at a conversion rate of 80 - 90%; and

(e) heating the reactor to 110 - 135 deg. C and then adding the flame retardant, inert gas and the foaming agent at a conversion rate of 85 - 95%.

An INDEPENDENT CLAIM is also included for the preparation of a foamed styrene resin bead.

USE - None given.

ADVANTAGE - The foamed styrene resin bead exhibits improvement with respect to particle size distribution, cell uniformity, foaming and other mechanical properties. Dwg.0/1

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TECHNOLOGY FOCUS - POLYMERS - Preferred components: The surface active agent is glycerylmonostearate or hydroxyalkylamine. The dispersing agent is polyvinylidone, tricalciumphosphate, polyvinylalcohol, cellulose derivative, calcium phosphate or pyrrolidone. The cell controller is sodiumphosphate, ammonium sulfate, hexabromocyclododecane or **polyethylene wax**.

Preferred Composition: The pre-mixture comprises (wt.%) styrene monomer (75 - 95), crosslinking agent (0.01 - 2.5), chain transfer agent (0.01 - 1), initiator (0.05 - 1) and surface active agent (0.005 - 1). The initiator comprises hot and cold initiators having a ratio of 1:6 - 1:2. The dispersion master comprises (wt.%) pure water (65 - 95) and dispersing agent (5 - 35). The injection number of the dispersion master can be changed according to the dispersion stability. The flame retardant (0.05 - 1 wt.%) is bisallylether, tribromophenylallylether or trisdibromopropylphosphate. The foaming agent (5 - 10 wt.%) is 3-6C alkanes.

Preferred Process: The method comprises the steps of cooling, washing, dehydrating and hot drying after the fourth polymerization. The inert gas is injected until the pressure of the reactor is 2 - 4 kg/cm².

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SPECIFIC COMPOUNDS - Dicumyl peroxide, acetylperoxide, t-allylbutylperoxide and t-allylbutylhydroperoxide are specifically claimed as the crosslinking agents. Cyclohexane, toluene, benzene, ethylbenzene, t-allyl-benzene, t-allylbutylchloride, t-allylbutylbromide and t-allylbutylisopropylbenzene are specifically claimed as the chain transfer agents. Benzoylperoxide, laurylperoxide, t-butylperoxybenzoate and 1,1-di(t-butylperoxy-3,3,5-trimethyl cyclohexane) are specifically claimed as initiators.

EXAMPLE - Styrene monomer (36 kg), dicumyl peroxide (89 g), ethyl benzene (45 g), t-butylperoxybenzoate (89 g), benzoylperoxide (178 g) and glycerylmonostearate (20 g) were mixed to prepare a pre-mixture. Pure water (4.04 kg) and tricalciumphosphate (0.71 kg) were heated to 90degreesC and mixed for 2 hours to prepare a dispersion master. Pure water (44.5 kg), dispersion master (1.14 kg), pre-mixture (18.2 kg) and styrene monomer (2 kg) were injected to a polymerization bath. When the conversion rate reached 10%, polyethylene homopolymer (44.5 g) and a third dispersion master (1.14 kg) were injected. When the reaction was almost completed, calcium hydroxide (1.79 g) and pure water (30 g) was added. The reaction was heated to 120degreesC. After 90 min. the melt of tetrabromobisphenol-bisallyl ether (178 g) and tribromophenylallylether (267 g) was injected and was filled with nitrogen to 2 kg/cm². Then pentane (3.56 kg) was injected. The resin bead slurry was cooled and the resin bead was washed out. After dehydrogenation and heat drying by dehydrogenation system, foamed styrene resin bead was finally produced. A comparative resin bead was produced by injecting pure water, dispersion master, styrene monomer, initiator and flame retardant before polymerization and then adding the cell controller at once. The expansion ratio (times) was 84 (immediately after production) and 80 (after aging for 90 days) while that of the comparative bead was 70 and 63 respectively. The compression strength and the flexural strength was 1.6 and 3.3 respectively while that of the comparative bead was 1 and 2.2 respectively.

FS CPI

FA AB

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